

# Pacific Northwest National Laboratory

**Jeff Stevenson**

**SECA Technology  
Field Work Proposal  
\$2.1M DOE**



---

## Goals and Objectives

- The FWP supports research to develop and test reliable , low cost, modular solid-oxide fuel cell (SOFC) systems for broad application. This project emphasizes the development of cost-effective materials and fabrication techniques for the various components in the SOFC stack and system, modeling of SOFC systems to allow for design optimization, and testing of SOFC's fabricated by cost-effective techniques in accordance with the optimized designs.



---

# Scope of Work - Summary of R&D

- **Task 1: SOFC Component Development**
  - Low Cost Fabrication of Electrode-supported SOFC's
  - Advanced Anode Development
  - SOFC Interconnects
  - Alloy Development via Powder Metallurgy
  - Rare Earth Coatings/Dopants
  - Seal Development for SOFC Stacks



---

## Scope of work - Summary of R&D

- **Task 2: SOFC Modeling**
  - Modeling of Rapid Startup
  - Modeling of Steady-State Operations
  - System Modeling
  - Diffusion Through Porous Anode Materials
- **Task 3: Experimental Support of Modeling**
- **Task 4: Prototype Stack Testing**



---

## **FY 00 Major Accomplishments and Impacts**

- **Operated a cell at 410mw/cm<sup>2</sup> for 1700 hours.**
- **Developed tape-casting and screen-printing methods to produce a co-sintered bi-layer anode supported structure.**
- **Performed evaluations and tests of compressive seals.**
- **Identified several potential oxidation resistant anode materials.**
- **Developed engineering software tools for stack structural and performance analysis. Initial analyses have been completed.**



---

## **Planned Activities for FY01**

- **Activities from FY 2000 will continue**
- **Currently evaluating adjustments based on research results including the Universities and results from the SECA planning workshops.**



---

## Project Benefits and Impacts

- **Resources addressing the major stack issues have been assembled in a coordinated multi-discipline team. Computer modeling has been coupled with materials science, engineering, and experimental work to approach key stack issues in a comprehensive approach**



---

# Project Benefits and Impact

- Eight papers have been published.
- Several record of inventions have been documented.
- Modeling work has begun to quantify the stress fields under different stack operating configurations and geometric configurations and work on failure criteria.

In my view this is one of the key but neglected components in the fuel cell business. PNNL has responded to this direction well.



---

# Issues and Concerns

- None

